Cooperative Water Program— High Priority Issues Addressed by Data Collection and Interpretative Science – FY12

The CWP values data collection activities *and* scientific investigations. The Program strives to maintain a balance in support of national USGS hydrologic networks and scientific investigations that inform local, State, Tribal, regional and national water issues.

Overall, CWP supports nearly 700 hydrologic investigations of the quality and quantity of the Nation's water resources, resulting in more than 325 publications in FY11. Key topics relate to water quantity and quality of surface water and groundwater to meet the Nation's myriad of water uses; environmental flows in streams needed to maintain ecosystem health; effects of changing land use on water availability; flood inundation and analysis of risks; sediment; and emerging contaminants in drinking water.

Data-collection activities support USGS national hydrologic-data networks, which constitute the foundation for all USGS mission areas, as well as watershed and aquifer management decisions by stakeholders across the Nation. The comprehensive, uniform, and accurate data on surface-water, groundwater, water-quality, sediment, and water-use are required for sustaining water that is available and safe for all drinking, ecosystems, industry, agriculture, energy, and navigation, and for water-rights determination by State and Federal agencies, as well as for simulating and forecasting hydrologic conditions and events. In addition, the long-term record of water quantity and quality developed by USGS is invaluable as a baseline for detection of change and to assess human influence over time.

The CWP partially or fully supports 77 percent of the USGS stream gages throughout the Nation, 95 percent of which provide information in real-time. In addition, the CWP supports more than 8,000 groundwater observation wells, many of which provide real-time information that is critical for drought analysis and tracking, as well as about 4,000 water-quality monitoring sites (many of which are real-time).

High priority data-collection activities associated with the CWP in FY12 include:

(1) enhancement of the hydrologic-data networks;
(2) improved accessibility and delivery of data; and
(3) increased availability of real-time data for surface water and groundwater.

Because of the widespread importance of USGS data, Science Centers are strongly encouraged to continue to allocate CWP funding to support data collection and USGS hydrologic data networks at similar levels in FY11. The National Program will continue to track and strive for a balance between data collection and interpretative studies (assessments and research), which is currently, on average, about 60 percent data collection and 40 percent interpretative studies within Centers.

Data and Interpretative Studies Support USGS Priorities

Data collection (i.e. networks) and interpretative studies support the USGS Science Strategy, and specifically six Water Mission and USGS priorities, including (1) water availability, (2) hydrologic hazards, (3) ecosystems, (4) environmental health, (5) energy, and (6) climate and land-use change.

Specific topics addressed by CWP activities are listed below that provide the foundation for water resource decision making at local, State, Tribal, regional, and national scales. Note: Many of the topics are those identified by stakeholders who participated in national stakeholder meetings and (or) in one of nine regional stakeholder roundtables held across the Nation.

While all topics listed under the six USGS priorities are important at local, State, Tribal, regional, and national scales, selected topics are noted in the guidance with italicized font that are of highest national priority to the Water Mission Area. Science priorities will continue to evolve as we await the completion of work by Science Strategy Planning Teams (SSPT) and as priorities are established by the Water Mission Program Council (consisting of Water Program Coordinators) and Policy Team (consisting of Water Technical Office Chiefs).

Water Availability

- *Water use (including conjunctive use; i.e. integrated groundwater/surface water management)*
- *Groundwater recharge and storage assessments, including the associated hydrogeologic framework of groundwater supplies, and groundwater/surface water modeling and analysis*
- *Assessments of in-stream flow requirements and water availability for environmental and wildlife needs*
- *National compilation, regionalization, estimation and distribution of streamflow (such as to ungaged sites)*
- Water budgets and systems analysis of hydrologic components – including precipitation, evapotranspiration, groundwater recharge, storage (including snowpack), and surface water flow
- Low flow, peak flow, and recreational flow assessments
- Geochemical constraints on water availability

Expected outcomes include critical information on the quantity, quality, and use of available surface water and groundwater needed for improved management of waters that serve as important local and regional sources of water supply and for the management and support of watershed ecosystems. The information will help in critical decisions on the timing of flow releases and allocation or reallocation of water resources to meet multiple needs, and decisions related to Federal reserved water rights and interstate compacts and water rights settlements.

CWP data collection and interpretative studies on water availability support the USGS initiative for a Water Census that results in improved information on water uses (including thermoelectric and irrigation, the two largest users), as well as watershed budgets and an improved understanding of water use and effects on the hydrologic components, including groundwater/surface water relations, evapotranspiration, surface water flows (such as needed to for ecosystem sustainability).

Hydrologic Hazards

- *Flood response, flood-frequency and inundation analysis and risks, improved depiction and communication tools to minimize impacts on life and property*
- *Drought risks, trends, and forecasting*
- Catastrophic movement of sediment and debris, such as associated with post-fire runoff
- Subsidence

Expected outcomes include (1) increased protection of lives and property and prevention of economic losses from floods, storm surge, debris flows, and droughts (which can amount to millions of dollars annually); and (2) improved forecasting of the probability of occurrence based on increased understanding of trends and processes driving hydrologic events.

Ecosystems

- *Environmental flow requirements and effects on aquatic communities*
- *Impacts of land-use change and practices on stream ecosystems (including best management practices, such as storm water management and combined sewer overflows in urban areas and*

controls of non-point contamination in all land uses)
- *Sources (point and non-point), transport, and fate of chemicals and algal toxins* (related to point and non-point sources) entering streams, estuaries, lakes, and reservoirs
- Effects of streamflow alterations on ecosystems
- Sediment transport and storage in streams, lakes, and reservoirs
- Assessing ecosystem services

Expected outcomes are improved information for (1) strategies to protect and restore streams; (2) regulations of point sources, mining permits, and Total Maximum Daily Load (TMDL) requirements of the Clean Water Act; (3) management of excessive nutrients and sediment originating upstream from estuaries and other receiving waters; and (4) strategies to control sources and transport of non-point contaminants (associated with urban, agricultural, and mining areas) to streams.

Environmental Health

- *Occurrence of emerging contaminants such as antibiotics, hormones, pharmaceuticals, and pesticides in source water used for drinking and their effects on ecosystem health*
- *Effects of naturally occurring contaminants (such as radiochemicals, mercury, arsenic, uranium, selenium, and perchlorate) and man-made activities on the quality of groundwater used for drinking*
- Effects of salt water intrusion on groundwater used for drinking
- Man-made contaminants in wastewater entering source water used for drinking
- Harmful organic compounds and algae in groundwater, streams, and reservoirs
- Contamination in recreational waters (such as microbial)

Expected outcomes are (1) clean and safe drinking water to citizens and early indication of possible water-quality problems required in long-term management and protection of groundwater resources that serve as a water supply for more than half of all Americans, and (2) improved warning and tracking of contamination affecting beach health and other recreational waters.

Energy

- Impacts of energy development, including coal bed methane extraction and hydrofracking, on surface water and groundwater quantity and quality
- Impacts of abandoned and active mining on water quality

Expected outcome is improved information for strategies to minimize impacts of energy and mineral development on the quality and quantity in streams and groundwater resources.

Climate and Land-Use Change

- *Analysis and tracking of groundwater levels*
- *Changes in streamflow patterns and trends (seasonal and over the long term)*
- Assessments on the timing, form, distribution, and intensity of precipitation events and impacts on water availability
- Impacts of sea-level rise
- Impacts of climate and land-use change on water supplies and demand
- Carbon sequestration

Expected outcome is long-term hydrologic data and hydrologic systems models that are capable of forecasting the consequences of climatic variability and land-use change, critical to local, State, regional and national water managers.